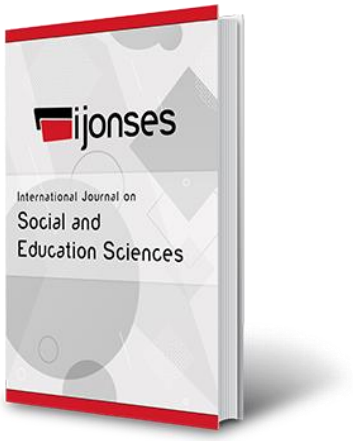

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Verbal-Visual Learning Styles Scale: Developing a Scale for Primary School Students

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Verbal-Visual Learning Styles Scale: Developing a Scale for Primary School Students

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Abstract

In this study, it is aimed to develop a measurement tool that can determine the learning styles of students in order to provide efficient learning environments in primary schools. For this purpose, a draft scale form consisting of 24 items defining verbal and visual learning styles on theoretical basis was prepared. Then, using the draft scale form, data were obtained from 296 students of primary school. The data obtained at this phase were analyzed by exploratory factor analysis (EFA). As a result, the final scale form consisting of two dimensions and 12 items was reached. Then, in order to verify the structure of the final scale form, data were obtained from 149 students of primary school, and a confirmatory factor analysis (CFA) was performed with these data. According to the results obtained at this stage, the two-dimensional, two-factor, and 12-item structure of the scale was confirmed. In addition, Cronbach's Alpha and stability coefficients were calculated, and as a result, it was determined that the scale made consistent and stable measurements. As a result, a valid and reliable measurement tool has been developed that can determine the learning styles of 8-11 year-old students studying in primary schools.

Introduction

Each training activity has specific purposes or objectives. These purposes or objectives are the unchangeable features of the teaching process. However, even if learners tend towards the same goal in the teaching process, they can follow their own unique paths to achieve the goal. The main factor that provides these differences is the individual characteristics of the learners. Physical, cognitive, social and physiological characteristics that are formed and differentiated by the effect of heredity or environment in the individual are called individual differences (Kuzgun & Deryakulu, 2017). Therefore, individual differences are the features that the learner brings to the learning process, affects the learning process and is affected by the learning process. It can be said that one of the distinguishing individual characteristics of learners in the learning environment is their learning style.

Learning style is defined as the learning way used by the learner in his own and consistently (Riding & Rayner, 2012) the ways that the learner prefers to receive and process information (Kolb, 1985) and the learner's strengths and preferences in obtaining, processing, and holding information in the learning process (Felder &

Silverman, 1988). Learning style is generally individual learning way. While some learners say that they learn better by listening, some learners may state that they learn better by watching. This is about learning style, in other words knowing how to acquire knowledge better. Because learning style is a distinctive behavior that shows how the learner learns and how he adapts what he learns to the environment (Gregorc, 1985). In the context of the learning process, it is understood that the learning style is an individual difference stemming from the learner.

In recent years, dozens of learning style definitions were made in the literature, and it was revealed that learning style is an effective individual difference on learning (Truong, 2016). Therefore, although there are approaches that explain the learning ways of the learner from various angles, basically the view that learners have different styles is dominant. Learning style classifications were made with different definitions in the literature. In these classifications modifier, assimilator, parser and inserter (Kolb, 1985); concrete sequential, concrete random, abstract sequential and abstract random (Gregorc, 1982); activist, theoretical, reflective and utilitarian (Honey & Mumford, 1986); visual, auditory, audiovisual and kinesthetic (Fleming, 2006); avoidant-participatory, competitive-collaborative and dependent-independent (Riechmann & Grasha 1974); feeling-intuitive, audio-visual, doing-thinking and sequential-holistic (Felder & Silverman, 1988); physical, verbal and visual (Şimşek, 2002) learning styles were determined and defined. It is stated in the specified classifications that learning styles are quite stable indicators (Coffield et al., 2004). When the practices and studies on learning styles in the literature are analyzed, it is seen that the verbal-visual learning style classification is mostly used (Akgün et al., 2014). The individual differences of learners with verbal and visual learning styles in the learning environment are given in Table 1.

Table 1. Individual Differences According to Verbal and Visual Learning Styles

Verbal Learning Style	Visual Learning Style
They prefer verbal instructions.	They prefer written or visual instructions.
They enjoy speaking and listening in a learning environment.	They enjoy watching and showing in a learning environment.
They remember very well the events that are told, spoken and discussed orally.	They remember the events presented by pictures, diagrams, figures or photographs very well.
They verbally encode the information they think important.	They underline and paint the places where the information they think important.
They are interested in word games such as crossword puzzles, word hunting.	They are interested in visual games such as memorization, painting and puzzles.
They revise what they learned verbally or by telling others.	They revise what they learned by taking notes, drawing or reading.

The fact that the learner has a verbal or visual learning style or if one of these styles is dominant may affect his participation and his preferences in the learning environment, his expectations from the learning environment. Because there are studies in the literature that state that learning style is an important learner feature that affects the learning environment (Bozkurt & Orak, 2016; Cevher & Yıldırım, 2020; Ozdemir et al, 2018). Cevher and

Yıldırım (2020) analyzed the studies on learning style. According to the results of this study, a significant relationship was found between the skills such as learning style and academic achievement, attitude towards learning and critical thinking. In this context, it can be said that learning style positively affects some learner characteristics. Therefore, learning environments designed and prepared according to the learning style directly affect the success and skills of the learners. However, in order to design and prepare an environment suitable for the learning style, at first it is necessary to determine the learning styles of the learners. At this point, valid and reliable measurement tools that can determine the learning styles of learners are needed. In the literature, there are many measurement tools used to determine learners' learning styles as valid and reliable (Childers, Houston & Heckler, 1985; Gregorc, 1982; Kolb, 1985; Riechmann & Grasha, 1974; Felder & Solomon, 1994; Şimşek, 2002; Şimşek, 2007; Gökdağ, 2004; Kirby, Moore, & Schofield, 1988). Most of these measurement tools are aimed at determining the styles of learners at secondary and undergraduate level. However, for an effective teaching, environments should be prepared according to the learning style starting from the basic education level. It is here clear that measurement tools are needed to determine learners' learning styles at the primary school level. In the literature, there are studies in which different measurement tools are used to determine the learning styles of primary school students as valid and reliable (Çukurbaşı-Çalışır, 2016; Eker, 2016; Günaydın, 2011; Güven & Özbek, 2007; Ortar, Çağırgan-Gülten & Özkan, 2012; Şimşek 2007). In some of these studies, it was seen that scales developed for different learning groups were adapted and used (Çukurbaşı-Çalışır, 2016; Eker, 2016; Günaydın, 2011), and in some of them, original scales were developed and used for primary school students (Güven & Özbek, 2007; Ortar, Çağırgan-Gülten & Özkan, 2012; Şimşek 2007). In one of these studies Güven and Özbek (2007) used a measurement tool that included 27 items in 8 dimensions for primary school 5th grade students (before 2012, 5th grade was regarded as primary school level); in another study, Otrar, Çağırgan-Gülten and Özkan (2012) developed a tool which had 4 dimensions, 36 items for primary school 4th and 5th grade students, and in another study, Şimşek (2007) used a tool that had 17 dimensions and 94 items for primary school 3rd, 4th and 5th grade students.

When the literature was analyzed, it was seen that many studies were conducted to determine elementary school students learning styles in Turkey and to analyze them in various ways; however, in this process, it was observed that scales at different levels and cultures were used adaptively in some studies, or scales suitable for the level and culture were developed and used in very few studies. On the other hand, it was seen that the dimensions and number of items in the scales developed and used were formed in a dense structure according to the level of primary school students (4 to 17 dimensions and 27 to 94 items). Therefore, it is thought that there is a need for a simpler and easily used learning styles scale for primary school students. In this study, it was aimed to develop a scale to determine the learning styles of primary school students. It is expected that the developed scale will contribute to teachers who want to prepare their classes according to their learning styles and to researchers who want to analyze the learning styles of primary school students from different angles.

Method

This study, which aims to develop a scale to determine the learning styles of primary school students, has a basic research feature in the quantitative research approach. A two-stage approach was used in the study. In the

first stage, a draft measurement tool was created and modeled theoretically, and in the second stage, the theoretical model was tried to be verified. Quantitative data were obtained and analyzed in two stages from different participants in the study.

Study Group

Since the general purpose of this study is a scale development study, sample estimation was not made from the universe. Therefore, the data of the study were obtained from 4th grade students studying in three different primary schools in Kilis city center. The data were collected in two stages due to the fact that two-stage approach was used in the study process.

In the first stage of the study, data were collected from 312 4th grade students from two different schools in Kilis city center. However, during the preparation of the data for analysis, six forms, which were identified as patterns, and eight forms, which were found to be more than 20 percent missing data, were excluded from the analysis. Later, two more forms were excluded from the analysis in terms of extreme value. Analyzes of the first stage were carried out with the data collected from 296 students from two different schools (8-11 age group; School A: 166, 56.1%; School B: 130, 43.9%; boys: 145, 48.6%; girls: 151, 51.4%). In the second phase of the study, data were collected from 155 students studying in the 4th grade of a different school in Kilis city center. However, six of the collected forms were excluded from the analysis due to reasons such as creating extreme value, containing more than twenty percent missing data and creating patterns, and at this stage, analyzes were carried out with the data collected from 149 students (8-11 age group; School C boys: 71, 47.9%; girls: 78, 52.1%).

Development of the Scale

Before preparing the draft scale form, tools that measure similar phenomena were collected in the literature and its items were analyzed (Felder & Solomon, 1994; Gökdağ, 2004; Kirby, Moore, & Schofield, 1988; Şimşek, 2002; Şimsek, 2007). In addition, Picard's (2000) indicators defining students with verbal-visual learning styles were taken into consideration (cited in Şimşek, 2007). After all the assessments and analysis, a draft scale form consisting of 12 items explaining the verbal learning and 12 visual learning dimensions was prepared. The draft scale form was prepared in 4-category Likert Type. The categories were expressed as “Completely Not Suitable for Me (1)", "Not Suitable for Me (2)", "Suitable for Me (3)" and "Completely Suitable for Me (4)". There was no reverse scoring in any of the items that form the draft scale.

The draft scale form was submitted to expert opinions in order to be evaluated in terms of content validity and compliance with the level, and the items were corrected in line with the expert opinions (Education Programs and Teaching, Assessment and Evaluation, Guidance and Psychological Counseling, Primary School Education experts and Primary School Teachers). The draft form was piloted with 26 4th grade students (except for the group from which the actual implementation data were obtained). The draft form was finalized with the feedback received from the pilot application.

Data Analysis

The data obtained by using the draft form of the Verbal-Visual Learning Styles Scale were transferred to the computer environment by scoring from 1 to 4 according to the answers given in the 4-category. Some data were excluded from the analysis for reasons such as extreme values, more than 20 percent missing data and patterns. Series averaging technique was used in assigning missing data detected in the data set included in the analysis.

Item analysis was carried out to prepare the draft scale for analysis, and exploratory (EFA) and confirmatory factor (CFA) analyzes were performed, respectively, to reveal the construct validity. In addition, item discrimination was analyzed to provide additional evidence for the validity of the scale. On the other hand, calculation of alpha coefficient and test-retest procedures were performed to create evidence for the reliability of the scale. For the analysis of the draft scale, correlational techniques were used first and the item-scale Pearson's correlation coefficient was calculated. At this phase, it was determined that all the draft scale items had a significant correlation value of .20 and above (Tavşancıl, 2006). Therefore, no substance was lost at this stage.

After analyzing the items, EFA was performed first to analyze the structure of the draft scale. At this phase, Kaiser-Maier Olkin (KMO) and Bartlett sphericity tests were used to decide whether the data obtained from 296 students are eligible for EFA. The KMO value was close to 1 and the Bartlett test was meaningful, which expressed the suitability of the sample number to be analyzed and the data collected (Bayram, 2015; Büyüköztürk, 2006; Güriş & Astar, 2015). Within the scope of KMO value, the suitability of the sample size for factor analysis evaluated as poor if it is between .50 and .60, weak if it is between .60 and .70, medium if it is between .70 and .80, good if it is between .80 and.90 and perfect if it is over .90 (Karagöz, 2017; Sharma, 1996; Tavşancıl, 2006).

In EFA, Kaiser value was taken as a criterion to decide the factor number of the scale (Field, 2009) and factors with an eigenvalue greater than 1 were used. In addition, scree plot graph was used as another criterion as the basis for the factor structure besides eigenvalue (DeVellis, 2014; Özdamar, 2016). In EFA, the draft scale was observed to exhibit a multi-factor structure and since it was assumed that there was no significant relationship between the factors theoretically, Varimax, one of the orthogonal rotation techniques, was used and the factor loads of the items forming the scale were analyzed. “Factor loads; 0.71 and above is excellent, 0.63 is very good, 0.55 is good, 0.45 is good / acceptable and 0.32 is poor ”(Çapık, 2014, p. 203). Accordingly, the cut-off point of the factor load in the initial phase was determined as .45. Then, the analyzes were repeated hierarchically, starting with the item with the lowest factor load. The total variance of the draft scale reached in EFA was taken as a basis between 40% and 60% (Büyüköztürk, 2006; Çokluk, Şekercioğlu, & Büyüköztürk, 2016; Karagöz, 2017; Tavşancıl, 2006) and in order to ensure that the explained variance is in the ideal range, In the latter stages, the factor cut-off point was determined as .55, which was a tighter value, and the analyzes were repeated over this value.

CFA was performed with the data obtained from 149 students in order to structurally verify the final scale form reached in EFA. In CFA, it is aimed to test and verify predetermined structural hypotheses among variables

(DeVellis, 2014). For this purpose, CFA is a method that tests the factor structures obtained from EFA (Özdamar, 2016). As a result of CFA, firstly t values of observable variables that form the model were analyzed. "Parameter estimates are significant at the level of 0.05 if t values exceed 1.96 and 0.001 if they exceed 2.56. In the analysis made within the framework of the structural equation model, non-meaningful t values should be excluded from the analysis" (Çokluk, Şekercioğlu, & Büyüköztürk, 2016, p. 304). At this phase, besides the t values, the error variances of the observed variables were analyzed to decide whether the model could work (Çokluk, Şekercioğlu, & Büyüköztürk, 2016).

In addition, model fit criteria were used to decide the validity of the model reached in CFA. The most frequently used fit criteria in the literature are chi-square fit index ($\chi 2$), chi-square, degree of freedom ($\chi 2/df$); however, this criterion is affected by the sample size. For this reason, "RMSEA (root mean square error average) and SRMR (standard mean square root of residuals) should be used for an effective evaluation since they are based on structural similarity functions, and other criteria should be considered to be helpful" (Özdamar, 2016, p. 185). Fit criteria that are helpful in the evaluation of the model and are generally used are; NFI (normalized fit index), NNFI (non-normalized fit index), CFI (comparative fit index), GFI (well-being fit index) and AGFI (adjusted well-being fit index). That the $\chi 2$ significance value is greater than 0.10, $\chi 2/df$ ratio is less than 5, GFI, AGFI, NFI, NNFI, CFI values are higher than 0.90, SRMR and RMSEA values are lower than 0.05 indicate model data fit (Karagöz , 2017; Özdamar, 2016).

Item analyzes were also conducted to create additional evidence about the structure of the final scale, which was reached in EFA and verified in CFA. In scale development studies, item analyzes should be performed in addition to other analyzes (Erkuş, 2016). Thus, the structure of the scale can be analyzed in more detail and additional evidence can be provided to other analyzes. Item validity was checked to determine the discrimination power of the two dimensions that form the draft scale and for each item. At this phase, 27% lower and 27% upper groups were defined over the total scores of the factors that form the scale. Then the item and total score averages of the groups were compared with the t-test. Cronbach Alpha and test-retest correlation coefficients were calculated, respectively, to determine the reliability of the final scale reached after EFA and CFA. It can be said that scales with a Cronbach Alpha value of over 0.70 have consistency, that is, the scale is reliable (Bayram, 2015; Büyüköztürk, 2006; Özdamar, 2016). In addition, in order to determine the reliability of the scale based on time, the scale was applied to 34 4th grade students at two weeks intervals and the correlation (stability coefficient) of the scores obtained after the applications was calculated. The high correlation value calculated by applying test-retest means that the measuring tool makes stable measurements (Erkuş et al., 2017).

Results

Results Regarding the Validity of the Scale

Exploratory (EFA) and confirmatory factor (CFA) analyzes were performed, respectively, in order to reveal the construct validity of the developed draft scale. Item analyzes were conducted to provide additional evidence for the construct validity of the scale. Kaiser-Maier Olkin (KMO) and Bartlett sphericity tests were taken into consideration in order to determine the suitability of the collected data to EFA. The KMO value obtained as a

result of the analysis is .78 and the result of Bartlett's sphericity test ($\chi 2=1652.47$, df=276, $p<0.01$) is significant. In accordance with the KMO value (.79) obtained in this context, it was determined that the sample size for EFA was close to a good level. In addition, according to the result of Bartlett sphericity test, it was determined that the data were suitable for EFA.

EFA was conducted within the scope of principal component analysis. As a result of the principal components analysis, it was seen that the draft scale was grouped under six factors with an eigenvalue greater than 1 (the factors were listed as 3.85; 3.76; 1.66; 1.22; 1.20; 1.09). It was determined that these six factors explained approximately 53% of the variances (the variances explained by the factors were 16.02%; 15.65%; 6.95%; 5.08%; 5.03%; 4.51%). At this phase, the item factor loads of the components reached for the factor structure of the scale and the scale-item correlation values within each component are given in Table 2.

Table 2. Factor Analysis Results of the Draft Scale before the Rotations

Item number	Scale-item Correlation	Factors					
		1	2	3	4	5	6
M17	.68	.66	.13	.16	-.15		-.25
M5	.64	.60	.19		.31		
M23	.66	.58	.19	.30	-.31	.22	.18
M1	.41	.58	.28	-.21		.42	
M19	.71	.53		.50			-.15
M11	.66	.51	.35	.16	-.19		-.21
M15	.31	.51	.13	-.31	.11	.16	.21
M3	.62	.48	.19	.27		-.20	-.35
M13	.31	.46	.35	-.34	-.18		.17
M9	.31	.41	.37	-.19		-.24	-.28
M18	.71		.69			-.31	
M12	.74	-.27	.68				
M2	.68		.64	-.25		.16	.16
M14	.64	-.12	.58			-.32	
M24	.62	-.32	.52	-.13	.11	.17	-.33
M4	.63	-.40	.51		-.13	.34	-.22
M22	.35	-.18	.46		-.15	-.24	.11
M6	.32	-.12	.44	.40		-.17	.36
M20	.36	-.22	.41		.32	-.13	
M10	.26	-.31	.14	.55	.41	.32	.11
M21	.39	.33		.42			.36
M7	.29	.35	.19	-.37	.36	.29	
M16	.32	-.23	.40		-.65		.26
M8	.37	-.38	.39	.18	-.10	.42	-.32

As seen in Table 1, the scale item correlation values of the items in each factor that constitutes the draft scale took values between .31 and .74. Thus, it can be said that the items that form the draft scale have a significant relationship with the factors that make up the scale. In addition, it was determined that almost all of the items that make up the draft scale were gathered under two factors. It was hereby assumed that these two factors were not related theoretically and the analyzes were continued by using Varimax, one of the vedic rotation techniques. Factors were rotated with Varimax factor rotation technique and factor loads of the items that make up the scale were analyzed.

Accordingly, first of all, the cut-off point of the factor load was determined as .45. Then, the analyses were repeated hierarchically, starting with the item with the lowest factor load. Thus, as a result of excluding items with a factor load of .45 from the scale, it was seen that the scale displayed its two-factor structure in the theoretical model. However, in this case, it was determined that the total variance explained by the scale remained at approximately 38%. The cut-off point of the factor load was pulled from .45 to .55 as a tighter value. Although there will be item loss, it was thought that the higher factor loads in the dimensions that make up the scale will increase the explained variance. The analyzes were renewed by removing items with factor loads less than .55 and it was seen that the draft scale explained 45.65% of the total variance under two factors with an eigenvalue greater than 1 (Factor 1 eigenvalue:2.82, explained variance 23.54%; Factor 2.65 eigenvalue:2.65, 22.11%).The cut-off point of the slope in the slope-slope graph was also analyzed in order to better understand the factor structure of the scale after the rotations. The scree plot graph obtained in EFA is given in Figure 1.

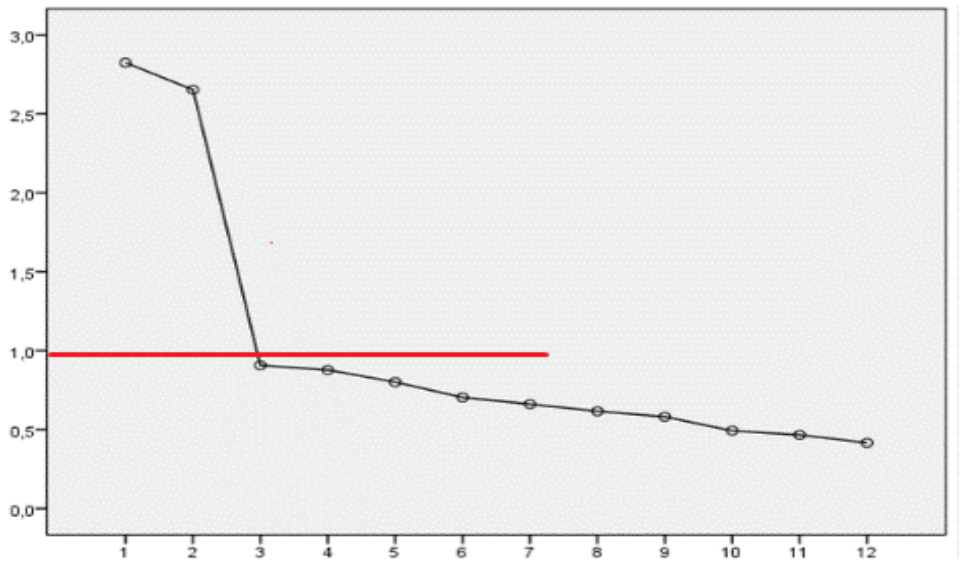

Figure 1. EFA Scree Plot Graph Cut-off Point of the Verbal-Visual Learning Styles Draft Scale

When the graph given in Figure 1 is analyzed, it is seen that the cut-off point of the slope is at the third eigenvalue. In this direction, it was decided that the two-factor structure that the draft scale displayed according to the eigenvalues and the variances it explained was correct. The factor loads and scale-item correlation values of the items forming the draft scale after the rotations are given in Table 3.

Table 3. Factor Analysis Results of the Draft Scale after Varimax Rotation Analysis

No	Item	Factor 1 23.54%	Factor 2 22.11%	Scale-item Correlation
M12	Çözmemi istedikleri soruları resim veya şekiller çizerek sorduklarında kolaylıkla anlarım. [I can easily understand the questions they want me to solve when they ask them by drawing pictures or figures.]	.74		.75
M18	Öğrendiğim yeni şeylerin resimlerini veya şekillerini kafamda canlandırmaktan hoşlanırım. [I like to envision pictures or figures of new things I learn.]	.73		.71
M2	Kitap okurken önemli gördüğüm yerlerin altını çizerim. [While reading the book, I highlight the places I consider important.]	.67		.68
M14	Unuttuğum bir şeyi hatırlamak için o şeyin resmini aklıma getirmeye çalışırım. [I try to remember a picture of that thing to remember something I forgot.]	.64		.64
M4	Öğretmenimin derste tahtaya çizdiği şekilleri, anlattıklarından daha kolay hatırlarım. [I remember the shapes my teacher drew on the board easier than he told me.]	.62		.61
M24	Gördüğüm bir şeyi kolay kolay unutmam. [I do not easily forget something I saw.]	.61		.56
M17	Öğretmenim dersin konusuyla ilgili hikâye anlattığında, konuyu daha kolay anlarım. [When my teacher tells a story about the topic of the lesson, I understand the topic more easily.]		.70	.73
M11	Derste anlatılan konuyu daha iyi anlamak için konu hakkında konuşmak isterim [I would like to talk about it in order to better understand the topic covered in the lecture.]		.67	.71
M19	Kitapta anlatılan konuyu daha iyi anlamak için kitabı sesli okurum. [I read the book aloud to better understand the topic described in the book.]		.67	.72
M3	Öğrendiklerimi unutmamak için başkalarıyla öğrendiğim şeyler hakkında konuşurum. [I talk to others about what I've learned in order not to forget what I've learned.]		.62	.70
M23	Yeni öğrendiğim bilgileri unutmamak için sesli olarak tekrar ederim. [I repeat it out loud in order not to forget the information I just learned.]		.61	.69
M5	Çözmem istenen soruları sözlü olarak sormalarını isterim. [I would like them to verbally ask the questions I am asked to solve.]		.59	.63

*Sentence in parenthesis are translated versions of the items, and provided for translation purposes only. One needs to validate the English version of the scale before using.

As can be seen in Table 3, the factor loads of the items in the first factor that form the draft scale are between

.61 and .74, the scale-item correlations are between .56 and .74, the factor loads of the items in the second factor are between .59 and .70, and the scale-item correlations are between .63 and .73. The draft scale, consisting of 24 items in two dimensions, exhibited a structure with two factors and 12 items as a result of EFA. The lack of a correlational significant relationship between the two factors that form the scale both confirmed the use of Varimax, one of the rotation techniques, and revealed that the factors that make up the scale define the two scales independently (-.038 and no significant relationship was found between the two factors). Therefore, it can be said that the two factors that make up the scale are separate scales and the two factors do not constitute a general factor as a whole. Among the factors reached after the rotations, the first factor was defined as "Visual Learning" and the second factor was defined as "Verbal Learning" as two separate scales in accordance with the theoretical structure. Items 2, 4, 12, 14, 18, and 24 were collected in the first factor, and items 3, 5, 11, 17, 19 and 23 were collected in the second factor. As a result of EFA, a two-dimensional and two-factor scale was obtained in accordance with the theoretical structure.

CFA was performed to test the fit of the two-dimensional, two-factor, and 12-item model determined by EFA. After CFA, firstly the *t* values diagram was analyzed to determine the significance of the observable variables that form the model. Diagram of *t* values of observable variables that make up the model is given in Figure 2 below.

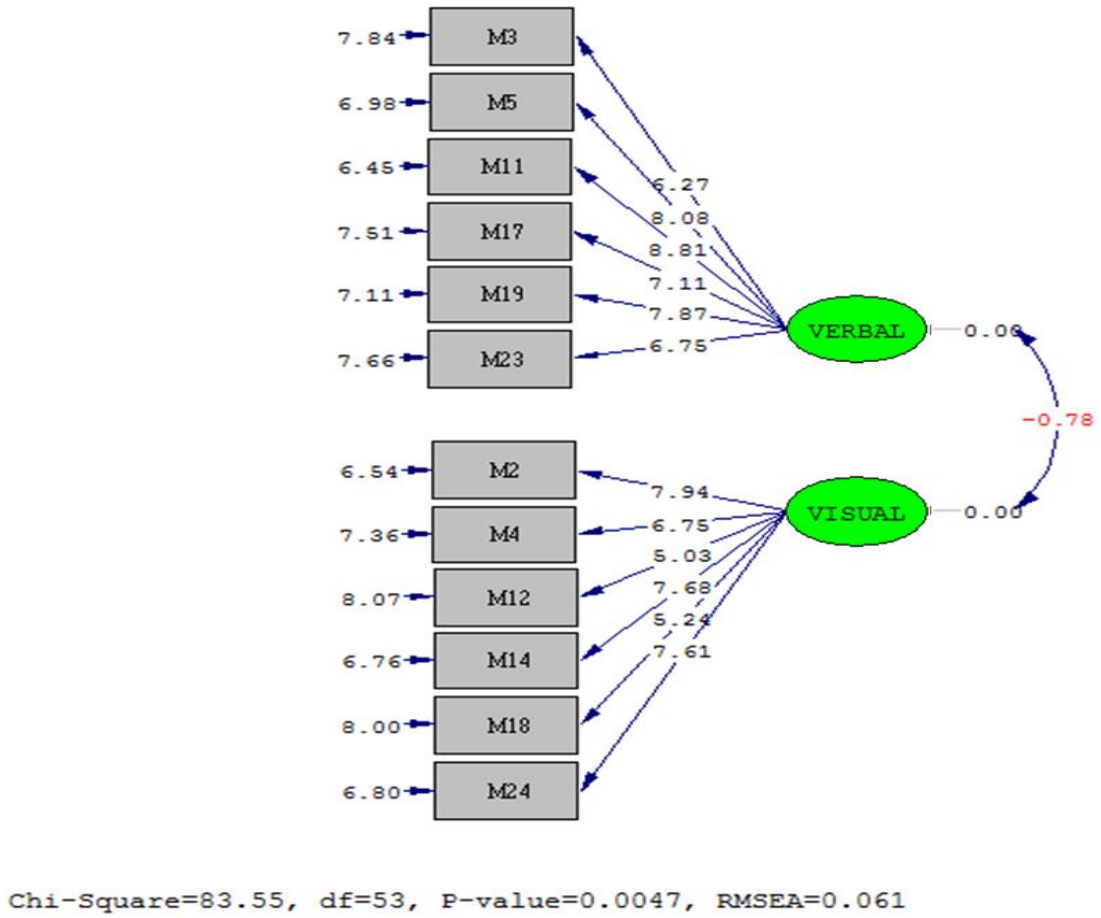

Figure 2. Verbal-Visual Learning Styles Draft Scale t Values Diagram

According to the t values diagram given in Figure 2, the t values of the observable variables that form the model took values between 5.03 and 8.81. It can be said that all of the items that make up the scale explain the phenomenon to be measured significantly. In addition, t value expressing the relationship between latent variables is not significant. It can be said that this situation supports the draft scale theoretically including two separate scales. On the other hand, in order to determine the significance of the observable variables that make up the model, besides the t values, the factor loads and error variances of the variables in the model were analyzed. Factor loadings and error variances diagram of observable variables are given in Figure 3 below.

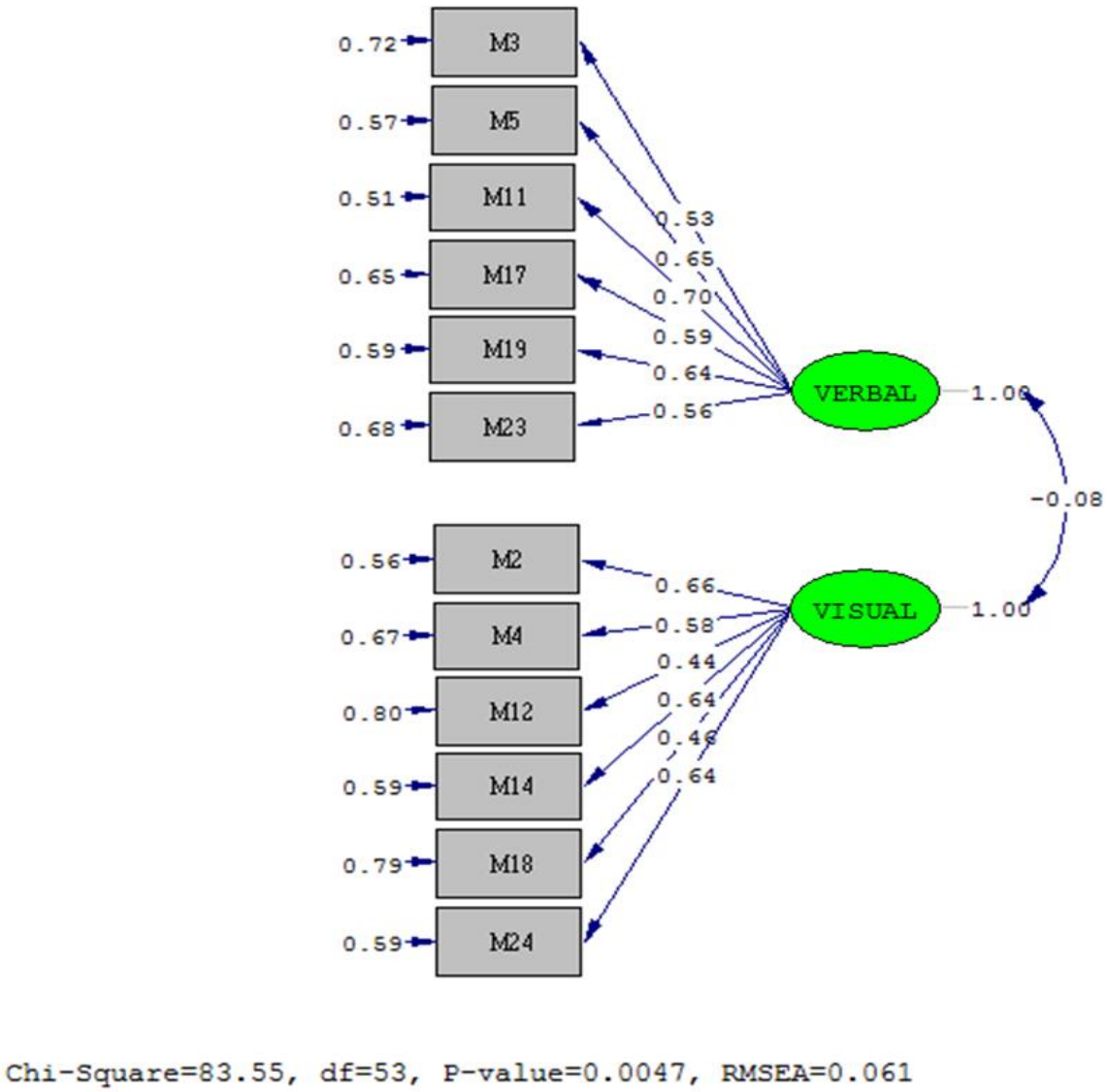

Figure 3. Factor Loadings and Error Variances Diagram of the Verbal-Visual Learning Styles Draft Scale

As seen in Figure 3, factor loads of observable variables vary between .44 and .70. Factor loadings above .40 can be shown as evidence that the items forming the scale explain the measured latent variable well. In addition, the error variances of the observable variables forming the model got values between 0.51 and 0.80. Therefore, it can be said that when the error variances of the observable variables that form the model and the t values given in Figure 2 are evaluated together, the items forming the scale can explain the phenomenon to be

measured. In CFA, fit criteria were taken into consideration to determine the harmony of observable variables and latent variables as a whole. In this context, the fit indices reached as a result of CFA and the fit ranges of these indices specified in the literature are given in Table 4.

Table 4. CFA Fit Indexes of the Verbal-Visual Learning Styles Draft Scale (Özdamar, 2016, p. 185-186)

Fit Criterion	Ideal Fit	Good Fit	Acceptable Compliance	Fit indexes of the Scale
$\chi 2$	p>0.10	0.05<p<0.10	p<0.05	0.0047*
$\chi 2$/df	<=2.00	2.00-5.00	----------	1.57
RMSEA	0-0.05	0.05-0.08	----------	0.061
SRMR	1.00	0.05-0.08	----------	0.079
NFI	1.00	0.90-1.00	0.85-0.89	0.87
NNFI	1.00	0.95-1.00	0.90-0.94	0.93
CFI	1.00	0.95-1.00	0.90-0.94	0.95
GFI	1.00	0.90-1.00	0.85-0.89	0.92
AGFI	1.00	0.90-1.00	0.85-0.89	0.88

** Mismatch apparent criteria*

According to the results obtained as a result of CFA, the value of $\chi 2$ / df (1.57) showed an ideal fit. In addition, RMSEA (0.061) and SRMR (0.079) values, which form the analysis based on structural similarity functions, showed good fit. The auxiliary criteria (NFI, NNFI, CFI, GFI and AGFI) also provided good and acceptable fit. Within the scope of all these evaluations, it can be said that a structurally valid scale was obtained.

After EFA and CFA, it can be said that the Verbal-Visual Learning Styles Scale, consisting of two dimensions and two factors and consisting of 12 items, exhibited a valid structure. However, in order to provide additional evidence for the validity of this developed scale, the distinctiveness of the two factors and each item, in other words, item validity was analyzed. Results obtained at this phase are given in Table 5 and Table 6.

Table 5. Results on the Distinctiveness of the Sub-Dimensions of the Verbal-Visual Learning Styles Scale

Dimensions	Groups	n	$\bar{X}$	Sd.	df	t
Visual Learning	Lower group	80	13.11	2.12	158	**38.96
	Upper Group	80	22.87	.71		
Verbal Learning	Lower group	80	12.62	2.20	158	**10.18
	Upper Group	80	18.51	2.80		

*** p<.001*

When Table 5 is analyzed, it is seen that the total mean scores of the sub-dimensions that form the scale differ significantly between the lower and upper groups. It can be said that the sub-dimensions of the scale distinguish the upper group from the lower group based on the total score. The item discrimination results of each item forming the scale are given in Table 6 below.

Table 6. Results on the Discrimination of the Items of the Verbal-Visual Learning Styles Scale

Items	Groups	n	$\bar{X}$	Sd.	df	t
M2	Lower Group	80	1.86	.95	158	15.27**
	Upper Group	80	3.68	.47		
M3	Lower Group	80	2.17	.86	158	13.87**
	Upper Group	80	3.07	.46		
M4	Lower Group	80	2.56	1.00	158	11.10**
	Upper Group	80	3.87	.33		
M5	Lower Group	80	1.91	.90	158	14.39**
	Upper Group	80	3.63	.58		
M11	Lower Group	80	2.28	1.04	158	11.31**
	Upper Group	80	3.73	.47		
M12	Lower Group	80	1.87	.94	158	16.22**
	Upper Group	80	3.77	.45		
M14	Lower Group	80	2.34	.88	158	13.60**
	Upper Group	80	3.84	.43		
M17	Lower Group	80	2.26	1.05	158	12.22**
	Upper Group	80	3.81	.42		
M18	Lower Group	80	2.08	.83	158	17.17**
	Upper Group	80	3.85	.40		
M19	Lower Group	80	1.55	.72	158	22.43**
	Upper Group	80	3.75	.50		
M23	Lower Group	80	2.17	1.01	158	13.02**
	Upper Group	80	3.77	.42		
M24	Lower Group	80	2.38	.87	158	13.96**
	Upper Group	80	3.86	.35		

***p<0.001*

As it can be seen in Table 6, the average scores of each item forming the scale differ significantly between the lower and upper groups. At this point, it can be stated that each item differentiates the upper and lower groups in terms of the measured feature.

Results Related to the Reliability of the Scale

In order to determine the reliability of the developed scale, at first the Cronbach Alpha coefficient was calculated. Alpha coefficient was calculated separately for each factor forming the scale. The alpha coefficient of the first factor, defined as "Visual Learning", was found as .74 and the second factor, defined as "Verbal Learning", was found as .76. In addition, in order to determine the reliability of the scale based on time, the scale was applied to 34 4th grade students at two-week intervals, and the correlation (stability coefficient) of the scores obtained after the applications was calculated. Since the scale includes two different measurement tools,

the stability coefficient for the “Visual” and “Verbal Learning” dimensions was determined separately. The correlation value between the two applications was calculated as .83 in the Visual Learning dimension and .74 in the Verbal Learning dimension. According to all these results, it can be said that the scale gives consistent and stable results and makes reliable measurements.

Conclusions, Limitations, and Suggestions

In this study, it was aimed to develop a scale to determine the learning styles of primary school students. A draft scale form with 24 items was prepared to define verbal and visual learning styles based on the literature. For the analysis of the draft scale form, data were collected, at two different time, from students in the age group of 8-11 who were studying in the 4th grade in Kilis city center . In the first phase, EFA was carried out with the data obtained from 296 students. As a result of EFA performed with Varimax rotation technique, a two-factor structure consisting of 12 items was presented. It was observed that the two-factor structure consisting of 12 items explained approximately 46% of the variances. In the literature, it is stated that the variance explained after factor analysis is between 40% and 60%, which is an expected and desired criterion (Büyüköztürk, 2006; Çokluk, Şekercioğlu, & Büyüköztürk, 2016; Karagöz, 2017; Tavşancıl, 2006). Therefore, it can be said that the structure reached in EFA is ideal. In addition, the factor loads of the items in the two factors were found to be between .59 and .74. It is considered good to have item factor loads above.55 (Çapık, 2014; Tabachnick & Fidell, 2015). It can be said that the factor loads obtained in EFA are sufficient. As a result of EFA performed at this stage, a two-dimensional and two-factor structure consisting of 12 items was introduced. The dimensions obtained were expressed as "Visual Learning" and "Verbal Learning", respectively, in accordance with the theoretical definitions. In order to test the structure obtained after EFA, data were collected for the second time from the 8-11 age group students studying in the 4th grade in Kilis city center.

CFA was performed with the data obtained from 149 students, and the two-dimensional and two-factor structure reached in EFA was confirmed in these analyzes. On the other hand, in order to provide additional evidence for the validity of the scale, the discrimination of the dimensions and items that form the scale was analyzed. It was seen that the dimensions and items of the scale distinguished the lower and upper groups. Therefore, it can be said that the scale has discriminatory validity.

It can be said that the eigenvalues of the two factors obtained in EFA are 2.82 and 2.65 respectively, and the variances explained by these factors are 23.54% and 22.11% respectively, supporting the two-dimensional structure of the scale. The results obtained as a result of CFA and the absence of a significant correlation between two factors in EFA and CFA proves this situation. Therefore, it can be said that the scale, which is put forward structurally after EFA and CFA, can be used as two different measurement tools as "Visual Learning Style" and "Verbal Learning Style". Cronbach's alpha coefficients for the dimensions of the scale were calculated as .83 and .74, respectively. It can be stated that scales with a Cronbach Alpha value of over 0.70 have consistency, that is, the scale in question is reliable (Bayram, 2015; Büyüköztürk, 2006; Özdamar, 2016). Therefore, it can be said that the scale made consistent measurements. On the other hand, test-retest technique was used to determine the time-dependent reliability of the scale. The correlation values of the scores obtained

in the two dimensions of the scale as a result of the applications at different times were calculated as .83 and .74, respectively. The high correlation value calculated by applying test-retest means that the measuring tool makes stable measurements (Erkuş et al., 2017). Therefore, it can be said that the scale made stable measurements.

When the results obtained in this study are evaluated in general, it can be said that the Verbal-Visual Learning Styles scale is a valid and reliable measurement tool. The scale can be used as two different measurement tools as "Visual Learning Style" and "Verbal Learning" style. In this context, it can be ensured that the verbal and / or visual learning styles of students in the age group of 8-11 studying at primary school are determined and which style is more dominant. The developed scale can be used by primary school teachers in order to design and prepare a learning environment suitable for individual differences, or by researchers for studies such as determining the dominant learning styles of primary school students and analyzing the relationships between learning styles and different variables.

Notes

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